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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,774	12/08/2003	Lynne A. Okada	50432-593	1080

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McDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER

ESTRADA, MICHELLE

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 08/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/728,774

Applicant(s)

OKADA ET AL.

Examiner

Michelle Estrada

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 8 and 9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8 and 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

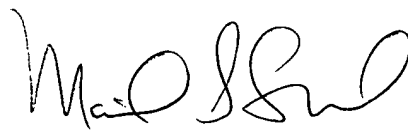
In view of the appeal brief filed on 5/11/06, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

A handwritten signature in black ink, appearing to read 'Matthew Smith', is positioned above the printed name.

Matthew Smith
Supervisory Patent Examiner
AU 2823

The allowability of claims 4-6 in the office action mailed 4/17/06 is withdrawn in view of a reference found during an updated search before allowance.

Specification

The disclosure is objected to because of the following informalities: in page 5, lines 12-13, it is described that the swelling material may be RELACS™. However, RELACS is not a material but a process: A chemical shrink technology, RELACS (Resolution Enhancement Lithography Assisted by Chemical Shrink), utilizes the cross linking reaction catalyzed by the acid component existing in a predefined resist pattern. This "RELACS" process is a hole shrinking procedure that includes simple coating, baking, and rinsing applied after conventional photolithography. Our target is realize of sub-70nm hole pattern formation by using new RELACS for ArF resist. At present, RELACS process is introduced to mass production of KrF lithography by using **AZ R200 (Product name of Clariant)** mainly. Then first of all we reported process performance of conventional RELACS material, AZ R200 with ArF resist. However AZ R200 does not show satisfactory shrinkage on ArF resist. Thereupon, we started on the development of new RELACS corresponding to ArF resist. As the result, we developed new RELACS material including Cross Linking Accelerator (CLA). It was found that CLA is able to improve reactivity of RELACS with ArF-resist. By using this new RELACS, It is Realized sub-70nm hole pattern formation with ArF-Ex lithography and It is able to Control of hole size by mixing bake (MB) temperature and additive ratio of CLA. Moreover this process was realized that thickness of shrunk hole is increased.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 4-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Besser et al. (2001/0051420).

Re claim 4, Besser et al. disclose forming an opening in a porous dielectric layer (130) comprising a first low-k material overlying a substrate (100), the opening defined by sidewalls of the porous dielectric layer having exposed pores; sealing exposed pores in the sidewalls by depositing a layer of dielectric material (440) on the sidewalls; and depositing a barrier metal layer (525A) lining the opening, the method comprising depositing the dielectric material completely sealing the pores (see fig. 4), therefore it is inherent that the dielectric material has a thickness substantially equal to a largest dimension of the exposed pores in order to seal them as shown in fig. 4.

Re claim 5, Besser et al. disclose depositing the dielectric layer at a thickness of 100 Å (Page 3, paragraph [0030]), which is within the range recited in claim 5 (10-300 Å).

Re claim 6, Besser et al. disclose depositing the dielectric layer at a thickness of 100 Å (Page 3, paragraph [0030]), which is within the range recited in claim 6 (10-250 Å).

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Kim (7,052,990).

Re claim 1, Kim discloses forming an opening in a porous dielectric layer (316/322) comprising a first low-k material overlying a substrate, the opening defined by sidewalls of the porous dielectric layer having exposed pores (See fig. 3B); sealing exposed pores in the sidewalls by depositing a swelling agent (350) lining the sidewalls and heating to swell the porous dielectric layer (Col. 7, lines 1-9); and depositing a barrier metal layer (316/334) lining the opening.

Re claim 2, Kim discloses filling the opening with metal (318/338); and conducting CMP such that the upper surface of the metal filling the opening is substantially coplanar with an upper surface of the porous dielectric layer (Col. 7, lines 44-46).

Re claim 3, Kim discloses forming the opening as a dual damascene opening (See fig. 3A); filling the opening with copper as the metal, wherein the porous dielectric layer has a dielectric constant less than 3.5 (Col. 7, lines 40-42).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim as applied to claims 1-3 above, and further in view of the following arguments.

Re claim 8, Kim does not disclose rinsing with water.

The Examiner takes judicial notice that is well known in the art at the time of the invention to clean with water after each processing step in the fabrication sequence, and made as routine as possible in order to avoid operator error.

It would have been obvious to one of ordinary skill in the art to rinse with water after the heating process to avoid operation error in the fabrication sequence.

Re claim 9, Kim discloses heating at a temperature of 100 °C to 250 °C (Col. 7, lines 5-9), which overlaps the recited range of claim 9 (25 °C to 200°C).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Estrada whose telephone number is 571-272-1858. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2800.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Michelle Estrada
Primary Examiner
Art Unit 2823

ME
July 25, 2006